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A review of *Madagopsina* Feijen, Feijen & Feijen (Diptera, Diopsidae) with description of a new species, key to the species, and discussion of intrageneric relationships

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Abstract

For the recently established genus *Madagopsina* (Diopsidae, stalk-eyed flies), *Madagopsina makayensis* Feijen, Feijen & Feijen, **sp. nov.** is described from Madagascar. A concise catalogue is given for the genus and an identification key is presented for its six species. The differential character states are listed for the two species groups of the genus: the *Madagopsina apollo* species group and the *Madagopsina apographica* species group. The intrageneric relations are discussed based on morphology, geometric morphometrics analysis of wing shape, and allometric data for eye span against body length. Each of these three procedures places the new species in the *M. apollo* species group with *Madagopsina parvapollina* as its closest relative. New records are presented for *M. apographica* and *M. parvapollina*.

Keywords

Allometry, catalogue, Madagascar, stalk-eyed flies, wing morphometry

Introduction

In 2018, Feijen et al. erected *Madagopsina* Feijen, Feijen & Feijen and *Gracilopsina* Feijen, Feijen & Feijen as endemic genera for Madagascar. These new genera were

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placed in a Diopsidae clade with irrorated wings, named the *Teleopsis* genus group. In *Madagopsina*, two earlier described species were placed: *Diopsis apollo* Brunetti and *Diopsis* (*Eurydiopsis*) *apographica* Séguy. In addition, three new species were described for *Madagopsina*: *M. freidbergi*, *M. parvapollina*, and *M. tschirnhausi*. Shortly after the 2018 publication, a single specimen of *Madagopsina* was received which turned out to be an undescribed species. This species is described herein. In *Madagopsina*, two species groups were distinguished by Feijen et al. (2018), the *Madagopsina apollo* species group and the *Madagopsina apographica* species group. Based on morphology, allometric data and geometric morphometrics analysis of wing shape, the new species is placed in the *M. apollo* species group. Because of the description of the new species, the sets of character states for the two species groups need to be adapted. A concise catalogue for *Madagopsina* is presented, as well as a new identification key to the six species of the genus. Some new *Madagopsina* records are included in the catalogue. The first live photographs of *M. parvapollina* are presented as these high-resolution pictures nicely show differential characters for the species group. In Feijen and Feijen (2021 in press), a key to the Afrotropical genera of Diopsidae is presented along with a synopsis of the Afrotropical Diopsidae fauna, including the genus *Madagopsina*.

Materials and methods

The description of *M. makayensis* Feijen, Feijen & Feijen, sp. nov. is based on a single male specimen that was preserved in alcohol. The holotype is now pinned with the genitalia placed in a genitalia tube attached to the pin. Some additional records for *Madagopsina* became known via photographs placed on www.iNaturalist.org. For the rate of dimorphism *D*, the difference between males and females in allometric slope for eye span on body length is used in the Diopsidae (Baker and Wilkinson 2001). Details on procedures for preparing genitalia slides, and procedures for taking measurements are given in Feijen et al. (2018). For information on morphological terminology and on photographic equipment used, the reader is referred to the same source. Some changes have been made to the terminology used: the aedeagus is now referred to as phallus, while the apodeme of the surstylus is now called the apophysis. The procedures for the wing geometric morphometrics analysis are described in Feijen et al. (2018). The following institutional codens and abbreviations are used:

RMNH Naturalis Biodiversity Center (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands,
AU Approximately Unbiased *p*-value,
BP Bootstrap Probability values,
D Rate of Dimorphism,
SE Standard Error.

Taxonomy

Family Diopsidae Billberg, 1820

Diopsidae Billberg, 1820: 115 (as Natio Diopsides). Type genus: *Diopsis* Linnaeus, 1775: 5.

Genus *Madagopsina* Feijen, Feijen & Feijen, 2018

Figures 1–31

Madagopsina Feijen, Feijen & Feijen, 2018:145. Type species *Diopsis apollo* Brunetti, 1928.
Eurydiopsis sensu Séguy & Vanschuytbroeck (nec Frey) - in part; Shillito 1971: 287; Feijen 1981: 482; Feijen 1989: 63; Feijen and Feijen 2013: 182, 185.

Remarks. A concise catalogue for the genus is given below. For details on the type series, records, and combinations to various other genera of the earlier described species can be referred to Feijen et al. (2018). Reference is now made to new records which appeared after this publication. The new species *Madagopsina makayensis* Feijen, Feijen & Feijen, sp. nov. is added.

Madagopsina apographica (Séguy, 1949)

Figures 12, 26

Diopsis (*Eurydiopsis*) *apographicus* Séguy, 1949: 69.
Eurydiopsis anjahanaribei Vanschuytbroeck, 1965: 336.
Madagopsina apographica; Feijen et al. 2018: 151.

New records. Madagascar, 1 ♀, Fianarantsoa, Vatovavy, Fitovinany, Ifanadiana, 21°15'34"S, 47°24'55"E, 977 m, 7.xi.2014, lemurtaquin, (ref. www.inaturalist.org/observations/36199753); 1 ?sex (probably ♀), Antsiranana, Sava, Sambava, rainforest, 14°26'60"S, 49°43'10"E, 1310 m, 30.x.2016, Éric Mathieu (ref. www.inaturalist.org/observations/69807405). The new records fall well within the eastern forests distribution as indicated in Feijen et al. (2018).

Madagopsina apollo (Brunetti, 1928)

Figures 9, 23

Diopsis apollo Brunetti, 1928: 280.
Madagopsina apollo; Feijen et al. 2018: 160.

Figures 1–2. *Madagopsina parvapollina*, live photographs by Gernot Kunz, Mahajanga, Boeny (www.inaturalist.org/observations/20766277) **1** anterior view **2** dorsal view.

Madagopsina freidbergi Feijen, Feijen & Feijen, 2018

Figures 13, 27

Madagopsina freidbergi Feijen et al., 2018: 165.

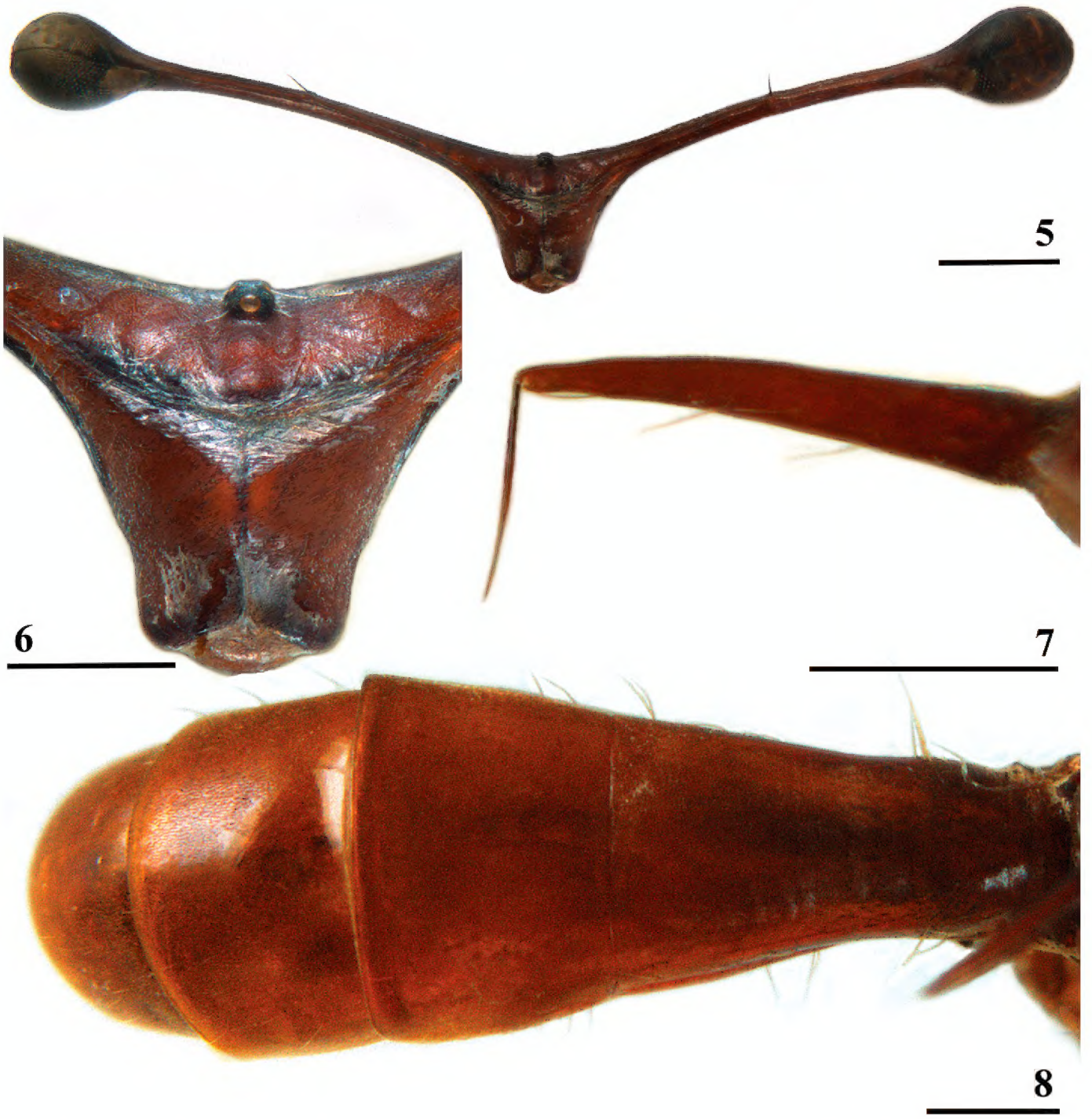
Figures 3–4. *Madagopsina makayensis* Feijen, Feijen & Feijen, sp. nov., ♂, holotype, Makay **3** habitus, dorsolateral view **4** thorax, dorsolateral view. Scale bars: 1 mm.

Madagopsina parvapollina Feijen, Feijen & Feijen, 2018

Figures 1, 2, 11, 25

Madagopsina parvapollina Feijen et al. 2018: 172.

New records. Madagascar, 1 ♂, Mahajanga, Boeny, 16°24'44"S, 45°18'48"E, 123 m, 23.x.2016, Gernot Kunz (ref. www.inaturalist.org/observations/20766277); 1 ?sex (probably ♂), Mahajanga, Boeny, Soalala, 16°26'4"S, 45°21'20"E, 138 m, Josiane Lips,



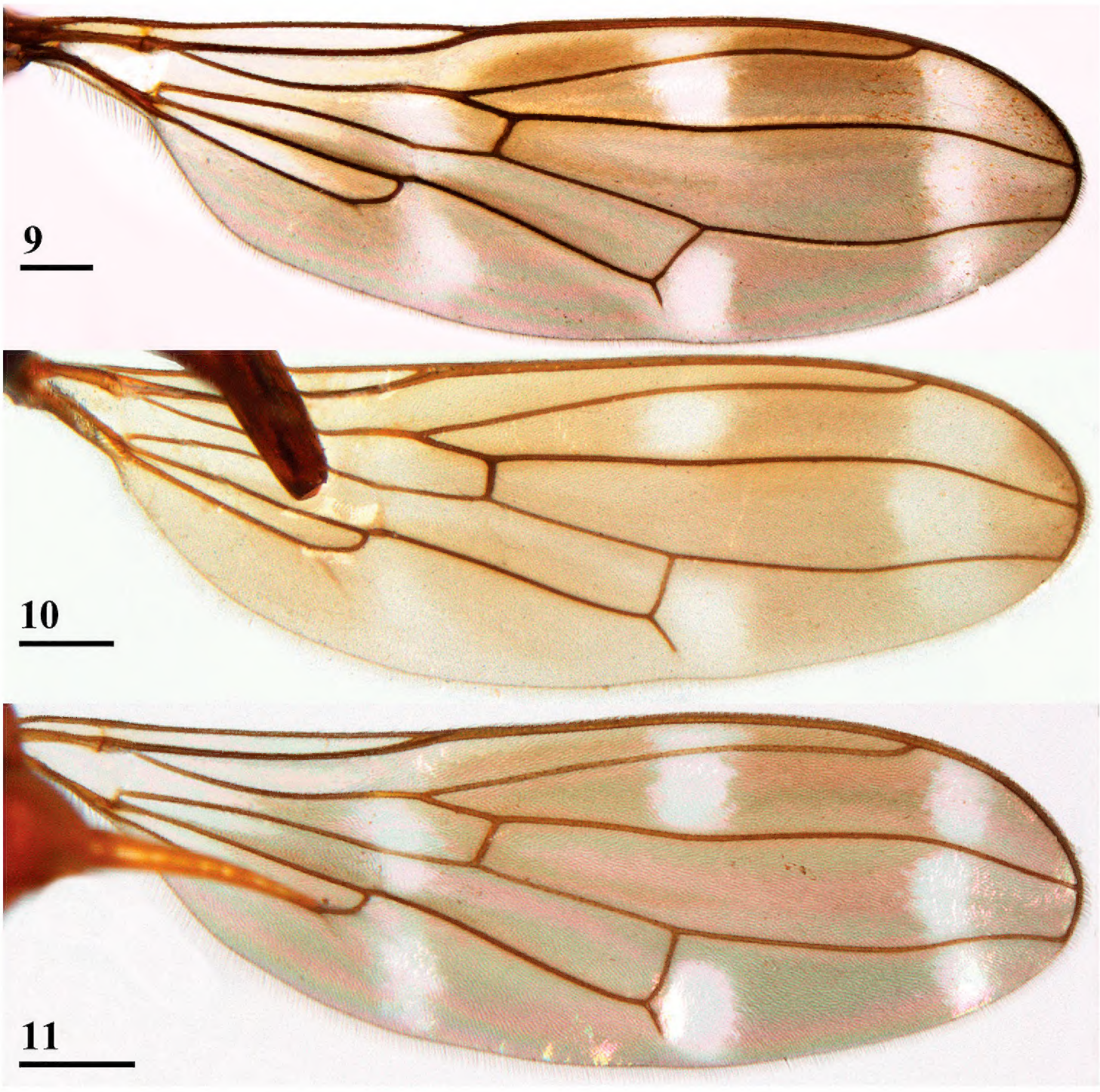
Figures 5–8. *Madagopsina makayensis* Feijen, Feijen & Feijen, sp. nov., ♂, holotype, Makay **5** head, anterior view **6** central head, anterior view **7** scutellar spine and apical seta, inner view (seta not in natural position in line with spine) **8** abdomen, dorsal view. Scale bars: 1 mm (**5**); 0.5 mm (**6–8**).

Olivier Testa (ref. www.inaturalist.org/observations/37503778 and www.inaturalist.org/observations/37503777), the photograph formed part of a batch made during a caving expedition in Namoroka caves, while all pictures were taken in caves or at the entrance; 1 ♂ Makay, canyon, sous-bois, rive d'une rivière [undergrowth, riverbank], 21°10'11"S, 45°22'15"E, 528 m, 30.vii–3.viii.2017, leg. Benoît Gilles. The new records fall well within the western forests distribution as indicated in Feijen et al. (2018).

Madagopsina tschirnhausi Feijen, Feijen & Feijen, 2018

Figures 14, 28

Madagopsina tschirnhausi Feijen et al. 2018: 178.

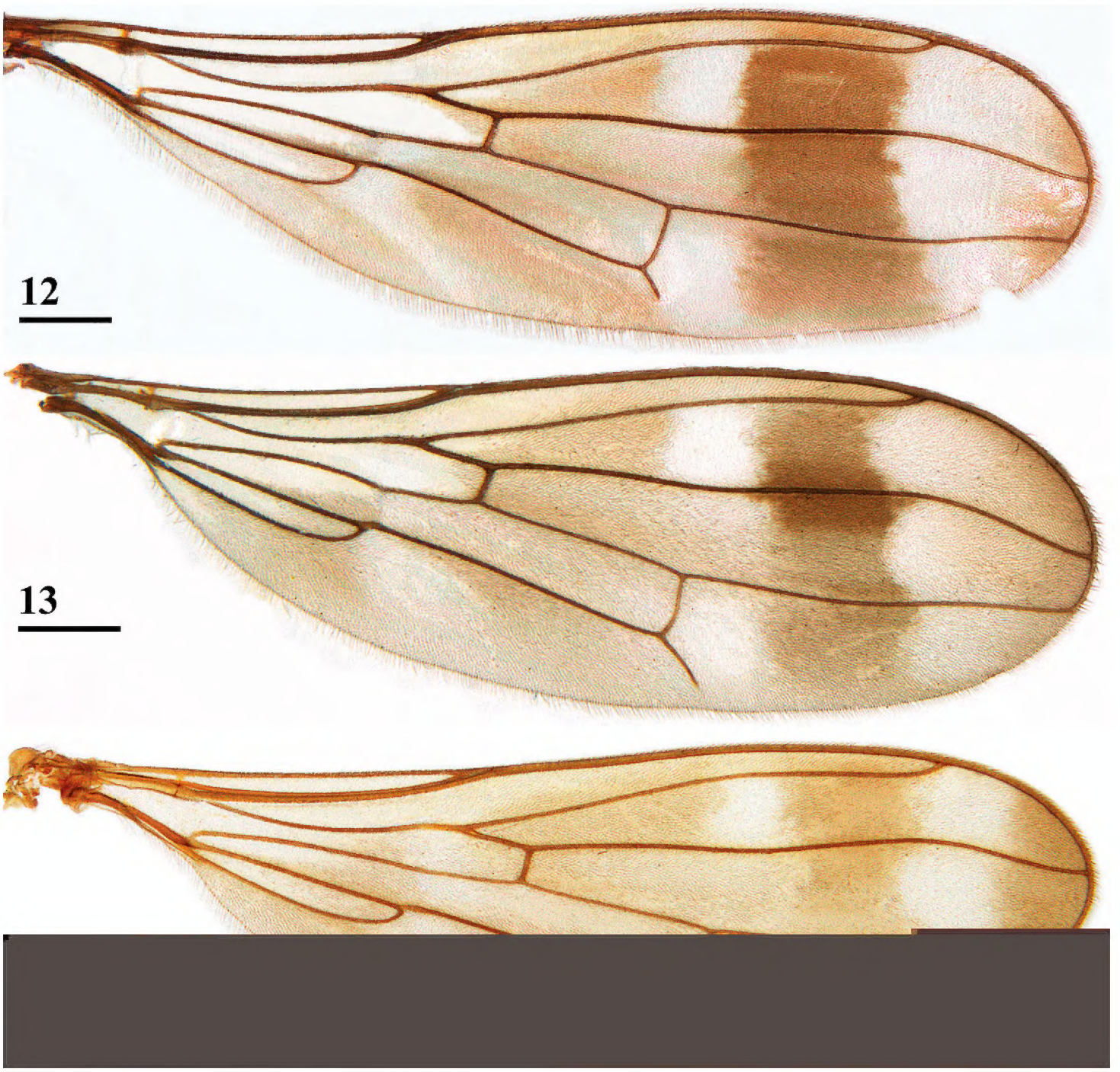


Figures 9–11. *Madagopsina apollo* species group, dorsal view of wings **9** *M. apollo*, ♂, Ambohitra **10** *M. makayensis* Feijen, Feijen & Feijen, sp. nov., ♂, holotype, Makay **11** *M. parvapollina*, ♀, paratype, Ankarana. Scale bars: 0.5 mm. Figures **9, 11** (Feijen et al. 2018, figures 6, 7).

***Madagopsina makayensis* Feijen, Feijen & Feijen, sp. nov.**
http://zoobank.org/A6766D1D-FCB3-49B6-A640-278DDE98BB4A
Figs 3–8, 10, 15–22, 24, 29–31

Type material. ***Holotype*,** ♂ (RMNH), Madagascar, Makay, canyon, sous-bois, rive d'une rivière [undergrowth, riverbank], 21°10'11"S, 45°22'15"E, 528 m, 30.vii–3.viii.2017, leg. Benoît Gilles.

Diagnosis. *Madagopsina makayensis* Feijen, Feijen & Feijen, sp. nov. can be recognised by its medium size (body length ♂ 7.3 mm), brown colour (however, due to conservation in alcohol it is likely that all the brown colours would be more yellowish in a live specimen, like in the other *Madagopsina* species), body mainly thinly pruinose (pollinose) with few small setulae, only katepisternum and katepimeron glossy,



Figures 12–14. *Madagopsina apographica* species group, dorsal view of wings **12** *M. apographica*, ♀, Fianarantsoa **13** *M. freidbergi*, ♀, paratype, Vohimana **14** *M. tschirnhausi*, ♂, holotype, Mount Ambre. Scale bars 0.5 mm. Figures **12–14** (Feijen et al. 2018, figures 8–10).

absence of facial teeth, medium-sized inner vertical seta (1.7 × stalk diameter), scutellar spines 2.0 × as long as scutellum, quite large apical seta (45% of scutellar spine length), incrassate fore femora with around 48 tubercles, irrorated wings with three vague crossbands including an H-shaped configuration with central and preapical crossbands, wing apex infuscated, central band slightly broader than preapical band, pale wing spots in cell r2+3 and cell m1, a vague pale spot in cell m4, abdomen club-shaped, no pruinose spots on tergites, ♂ spiracles 7 in slit of synsternite 7+8, surstyli rounded and bulbous with an apically rounded apophysis, microtrichia on posterior apical third, phallapodeme with ratio posterior arm/anterior arm 1.05, straight ejaculatory apodeme with only a slight sickle-shape apically, phallus remarkably broad and sclerotised, assumed moderate sexual dimorphism with regards to eye span ($D \approx 1.0$),